

F.Y.B.SC. SEM – I (CBCS - 2016 Course) : WINTER - 2018
SUBJECT : STATISTICS : DISCRETE PROBABILITY & PROBABILITY
DISTRIBUTIONS – I

Day : Tuesday
Date : 23/10/2018

W-2018-0688

Time: 11.00 A.M TO 02.00 PM
Max. Marks : 60

N.B:

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Draw neat and labeled diagram **WHEREVER** necessary.
- 4) Use of statistical tables and calculator is **ALLOWED**.

Q.1 A) Choose the correct alternative for: (06)

- 1) Height of object has sample space _____.
a) Finite b) Countably Infinite c) Discrete d) Continuous
- 2) For a sample space $\Omega = \{w_1, w_2, w_3, w_4\}$,
 $P(w_1) = \frac{1}{8} = P(w_2), P(w_3) = k, P(w_4) = \frac{3}{8}$.
For what value of k will this be a probability model?
a) 0 b) 1 c) $\frac{3}{8}$ d) 1
- 3) A random variable (r.v.) X takes value 0, 1, 2, 3 with probabilities 0.1, 0.5, 0.2, 0.2 respectively. Then median of X is _____.
a) 0 b) 1 c) 2 d) 3
- 4) If $\beta_2 = 0$ then the probability distribution is _____.
a) Mesokurtic b) Leptokurtic c) Playtykurtic d) Symmetric
- 5) If $E(X) = 3, Y = \frac{X-2}{5}$ then $E(Y)$ is _____.
a) $\frac{1}{5}$ b) $\frac{17}{5}$ c) $\frac{5}{17}$ d) 17
- 6) If $X \sim B(n, p)$ and $E(X) = \frac{5}{3}, Var(X) = \frac{10}{9}$, then the value of $q = 1 - p$ is _____.
a) $\frac{1}{3}$ b) $\frac{2}{3}$ c) $\frac{1}{6}$ d) $\frac{5}{6}$

B) Attempt each of the following: (06)

- 1) Define random experiment.
- 2) Define probability model.
- 3) Define median of a discrete r.v.
- 4) State any two properties of distribution function.
- 5) Define classical definition of probability.
- 6) Define discrete uniform distribution.

P.T.O.

Q.2 Attempt any **THREE** of the following: (12)

- a) Describe the concept of deterministic and non-deterministic models.
- b) Let A and B be two events define on Ω .
Show that
 - i) $P(\phi) = 0$
 - ii) If $A \subset B$ then $P(A) \leq P(B)$
- c) The probability distribution of a r.v. is as follows:
 $P(0) = 3k^3, P(1) = 4k - 10k^2, P(2) = 5k - 1$.
Find : i) k ii) $P(1 < X \leq 2)$
- d) For a certain probability distribution of r.v. X $\mu_1' = 5, \mu_2 = 2, \gamma_1 = 1$ and $\beta_2 = 4$. Find the first four raw moments of X.

Q.3 Attempt any **FOUR** of the following: (12)

- a) If X follow Bernaulli distribution with parameter p then find first three raw moments of X.
- b) If X is discrete r.v. then show that $E(aX + b) = aE(X) + b$, where a and b are constants.
- c) A discrete r.v. X has probability distribution as below:

X	-1	0	1	2	3
P(x)	0.12	0.18	0.35	0.20	0.15

Find median and mode of X.

- d) A parcel of 12 books contains 4 books with loose binding. What is the probability that a random selection of 6 books, without replacement, will contain 3 books with loose binding?
- e) Let $X \sim B(n, p)$ such that mean and variance are 3 and 2.1 respectively. Find n and p

Q.4 Attempt any **TWO** of the following: (12)

- a) State and prove Baye's theorem for posterior probabilities.
- b) State and prove addition theorem for two events A and B defined on Ω . Also state it for three events.
- c) Suppose $X \sim B(n, p)$
 - i) If $p = 0.6, E(X) = 6$, find n and $Var(X)$.
 - ii) Is it possible to have $E(X) = 3, Var(X) = 5$.

Q.5 Attempt any **TWO** of the following: (12)

- a) Define hypergeometric distribution
If $X \sim H(N, M, n)$ then find mean of X.
- b) Let $X \sim B\left(5, \frac{1}{2}\right), Y \sim B\left(8, \frac{1}{2}\right)$, X and Y are independent.
Find : i) $P(X + Y = 5)$ ii) $P(X + Y \leq 1)$ iii) $P\left(\frac{X + Y}{2} \geq 1\right)$
- c) Find mean and variance of discrete uniform distribution taking values 1, 2, 3, ..., n. Also find third ordered central moment of uniform distribution.